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IS 3909 (1986): Aluminium Unequal Leg Angles [CED 7:
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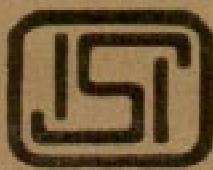


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IS : 3909 • 1986

Indian Standard
SPECIFICATION FOR
ALUMINIUM UNEQUAL LEG ANGLES
(First Revision)

UDC 669.71-423.2



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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR
ALUMINIUM UNEQUAL LEG ANGLES
(First Revision)

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(*Continued on page 2*)

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(Continued from page 1)

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(Continued on page 9)

Indian Standard

SPECIFICATION FOR
ALUMINIUM UNEQUAL LEG ANGLES
(*First Revision*)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 24 March 1986, after the draft finalized by the Structural Sections Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 Aluminium, because of its lightness, strength and better resistance to atmospheric corrosion, has gained popularity in structures especially for use in hilly areas and in defence establishments.

0.3 A large number of variety of aluminium sections are being produced in the country. In order to standardize these sections for their economic production, the Committee had formulated Indian Standard series covering angles, channels, beams and tee sections for structural use and other applications.

0.4 This Indian Standard was first formulated in 1966. In this revision alloys with new definitions as covered in IS : 733-1983* have been used apart from the addition of some more commonly used sections.

0.5 In the preparation of this standard the Committee kept in view manufacturing and trade practices followed in the country in this field.

0.6 A code of practice for use of aluminium alloys in structures, namely, IS : 8147-1976† was published which covers provisions for the design of structures (except bridges and pressure vessels) using aluminium alloys.

0.7 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960‡. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Specification for wrought aluminium and aluminium alloys, bars, rods, and sections (for general engineering purposes) (*third revision*).

†Code of practice for use of aluminium alloys in structures.

‡Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard covers the material dimensions and sectional properties of aluminium unequal leg angles for structural use and other applications.

2. TERMINOLOGY

2.0 For the purpose of this standard the following definitions shall apply.

2.1 Y-Y Axis — A line parallel to the axis of the longer flange and passing through the centre of gravity of the profile of the section.

2.2 X-X Axis — A line passing through the centre of gravity of the profile of the section, and at right angles to the Y-Y axis.

2.3 U-U and V-V Axes — Lines passing through the centre of gravity of the profile of the section, representing the principal axis of angle sections.

3. SYMBOLS

3.1 Letter symbols used in this standard have been indicated in the figure appearing in Table 1. The letter symbols used in Table 1 shall have the meaning indicated against each as given below:

a = Sectional area;

M = Mass of the section per unit length;

I_x = Movement of inertia about the X-X axis;

I_y = Movement of inertia about the Y-Y axis;

I_u = Movement of inertia (*Max*) about the U-U axis;

I_v = Movement of inertia (*Min*) about the V-V axis;

e_x = Distance of extreme fibre from the X-X axis, ($A-C_x$);

e_y = Distance of extreme fibre from the Y-Y axis, ($B-C_y$);

$$Z_x = \frac{I_x}{e_x} = \text{Modulus of section about the X-X axis;}$$

$$Z_y = \frac{I_y}{e_y} = \text{Modulus of section about the Y-Y axis;}$$

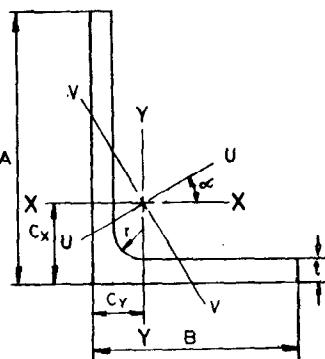
$$r_x = \sqrt{\frac{I_x}{a}} = \text{Radius of gyration about the X-X axis;}$$

$$r_y = \sqrt{\frac{I_y}{a}} = \text{Radius of gyration about the Y-Y axis;}$$

$$r_u = \sqrt{\frac{I_u}{a}} = \text{Radius of gyration about the U-U axis; and}$$

$$r_v = \sqrt{\frac{I_v}{a}} = \text{Radius of gyration about the V-V axis.}$$

TABLE I INDIAN STANDARD ALUMINIUM UNEQUAL LEG ANGLES
(Clauses 3.1, 5.1 and 5.1.1)



| DESIGNATION AND SIZE (A × B × t, in mm) | MASS* PER METRE LENGTH kg/m | SEC- TIONAL AREA cm ² | RA- DIUS AT Root mm | CENTRE OF GRAVITY | | MOMENT OF INERTIA | | | | RADIUS OF GYRATION | | | | MODULUS OF SECTION | | TAN α |
|--|-----------------------------|----------------------------------|---------------------|-------------------|----------------|-------------------|----------------|------------------|------------------|--------------------|----------------|------------------|------------------|--------------------|----------------|--------------|
| | | | | C _x | C _y | I _x | I _y | I _{Max} | I _{Min} | r _x | r _y | r _{Max} | r _{Min} | Z _x | Z _y | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
| ALU20×10×1·5 | 0·12 | 0·46 | 4·0 | 0·69 | 0·23 | 0·18 | 0·03 | 0·20 | 0·02 | 0·63 | 0·26 | 0·65 | 0·21 | 0·14 | 0·04 | 0·26 |
| ALU20×10×2·0 | 0·16 | 0·59 | 4·0 | 0·72 | 0·25 | 0·23 | 0·04 | 0·25 | 0·03 | 0·63 | 0·26 | 0·64 | 0·21 | 0·18 | 0·05 | 0·26 |
| ALU20×15×1·5 | 0·14 | 0·54 | 4·0 | 0·60 | 0·37 | 0·21 | 0·10 | 0·25 | 0·06 | 0·62 | 0·43 | 0·69 | 0·32 | 0·15 | 0·09 | 0·54 |
| ALU20×15×2·0 | 0·19 | 0·69 | 4·0 | 0·63 | 0·39 | 0·27 | 0·13 | 0·32 | 0·07 | 0·62 | 0·43 | 0·68 | 0·32 | 0·19 | 0·11 | 0·54 |
| ALU20×15×3·0 | 0·27 | 0·99 | 4·0 | 0·67 | 0·43 | 0·37 | 0·17 | 0·45 | 0·10 | 0·61 | 0·42 | 0·67 | 0·31 | 0·28 | 0·16 | 0·54 |
| ALU30×15×2·0 | 0·25 | 0·91 | 5·0 | 1·03 | 0·33 | 0·84 | 0·14 | 0·89 | 0·09 | 0·96 | 0·39 | 0·98 | 0·32 | 0·42 | 0·12 | 0·26 |
| ALU30×15×3·0 | 0·35 | 1·31 | 5·0 | 1·09 | 0·37 | 1·17 | 0·20 | 1·24 | 0·13 | 0·94 | 0·39 | 0·97 | 0·31 | 0·61 | 0·17 | 0·25 |
| ALU30×20×2·0 | 0·27 | 1·01 | 5·0 | 0·94 | 0·47 | 0·92 | 0·33 | 1·05 | 0·19 | 0·95 | 0·57 | 1·02 | 0·43 | 0·44 | 0·21 | 0·43 |
| ALU30×20×3·0 | 0·40 | 1·46 | 5·0 | 0·99 | 0·51 | 1·29 | 0·46 | 1·48 | 0·27 | 0·94 | 0·56 | 1·01 | 0·43 | 0·64 | 0·31 | 0·43 |
| ALU30×20×4·0 | 0·51 | 1·89 | 5·0 | 1·03 | 0·55 | 1·63 | 0·57 | 1·86 | 0·34 | 0·93 | 0·55 | 0·99 | 0·42 | 0·85 | 0·39 | 0·42 |
| ALU40×20×2·0 | 0·32 | 1·21 | 5·0 | 1·36 | 0·41 | 2·03 | 0·35 | 2·15 | 0·23 | 1·29 | 0·54 | 1·33 | 0·43 | 0·77 | 0·22 | 0·26 |
| ALU40×20×3·0 | 0·48 | 1·76 | 5·0 | 1·42 | 0·45 | 2·89 | 0·49 | 3·06 | 0·32 | 1·28 | 0·53 | 1·32 | 0·43 | 1·12 | 0·32 | 0·26 |
| ALU40×20×4·0 | 0·62 | 2·29 | 5·0 | 1·46 | 0·49 | 3·67 | 0·62 | 3·89 | 0·41 | 1·27 | 0·52 | 1·30 | 0·42 | 1·45 | 0·41 | 0·25 |
| ALU40×25×2·0 | 0·36 | 1·34 | 6·0 | 1·25 | 0·54 | 2·19 | 0·67 | 2·45 | 0·41 | 1·28 | 0·71 | 1·35 | 0·55 | 0·80 | 0·34 | 0·38 |
| ALU40×25×3·0 | 0·52 | 1·94 | 6·0 | 1·31 | 0·59 | 3·13 | 0·94 | 3·50 | 0·57 | 1·27 | 0·70 | 1·34 | 0·54 | 1·16 | 0·49 | 0·38 |
| ALU40×25×4·0 | 0·68 | 2·52 | 6·0 | 1·35 | 0·63 | 3·98 | 1·19 | 4·46 | 0·72 | 1·26 | 0·69 | 1·33 | 0·53 | 1·51 | 0·64 | 0·38 |
| ALU45×30×3·0 | 0·60 | 2·24 | 6·0 | 1·43 | 0·70 | 4·56 | 1·65 | 5·25 | 0·96 | 1·43 | 0·86 | 1·53 | 0·66 | 1·49 | 0·72 | 0·44 |
| ALU45×30×4·0 | 0·79 | 2·92 | 6·0 | 1·47 | 0·74 | 5·91 | 2·10 | 6·76 | 1·52 | 1·42 | 0·85 | 1·25 | 0·65 | 1·95 | 0·93 | 0·43 |
| ALU45×30×5·0 | 0·97 | 3·58 | 6·0 | 1·52 | 0·78 | 7·04 | 2·51 | 8·08 | 1·50 | 1·40 | 0·84 | 1·47 | 0·64 | 2·36 | 1·13 | 0·40 |
| ALU50×25×3·0 | 0·60 | 2·24 | 6·0 | 1·74 | 0·53 | 5·80 | 1·00 | 6·15 | 0·65 | 1·61 | 0·67 | 1·66 | 0·54 | 1·78 | 0·50 | 0·26 |
| ALU50×25×4·0 | 0·79 | 2·92 | 6·0 | 1·79 | 0·57 | 7·43 | 1·26 | 7·87 | 0·82 | 1·60 | 0·66 | 1·64 | 0·53 | 2·31 | 0·65 | 0·26 |
| ALU50×25×5·0 | 0·97 | 3·58 | 6·0 | 1·83 | 0·61 | 8·96 | 1·50 | 9·47 | 0·99 | 1·58 | 0·65 | 1·63 | 0·53 | 2·83 | 0·79 | 0·25 |
| ALU50×30×3·0 | 0·64 | 2·39 | 6·0 | 1·64 | 0·67 | 6·15 | 1·69 | 6·81 | 1·03 | 1·61 | 0·84 | 1·69 | 0·66 | 1·83 | 0·73 | 0·36 |
| ALU50×30×4·0 | 0·84 | 3·12 | 6·0 | 1·68 | 0·71 | 7·91 | 2·16 | 8·75 | 1·32 | 1·59 | 0·83 | 1·68 | 0·65 | 2·38 | 0·94 | 0·36 |
| ALU50×30×5·0 | 1·03 | 3·83 | 6·0 | 1·73 | 0·75 | 9·55 | 2·58 | 10·54 | 1·59 | 1·58 | 0·82 | 1·66 | 0·64 | 2·92 | 1·15 | 0·35 |
| ALU60×30×3·0 | 0·73 | 2·72 | 7·0 | 2·05 | 0·61 | 10·22 | 1·77 | 10·84 | 1·15 | 1·94 | 0·81 | 2·00 | 0·65 | 2·59 | 0·74 | 0·26 |
| ALU60×30×4·0 | 0·96 | 3·55 | 7·0 | 2·11 | 0·65 | 13·16 | 2·25 | 13·96 | 1·46 | 1·93 | 0·80 | 1·98 | 0·64 | 3·38 | 0·96 | 0·26 |
| ALU60×30×5·0 | 1·18 | 4·36 | 7·0 | 2·15 | 0·69 | 15·94 | 2·70 | 16·88 | 1·76 | 1·91 | 0·79 | 1·97 | 0·64 | 4·15 | 1·17 | 0·26 |
| ALU60×40×4·0 | 1·07 | 3·95 | 7·0 | 1·93 | 0·94 | 14·48 | 5·20 | 16·66 | 3·02 | 1·92 | 1·15 | 2·05 | 0·88 | 3·54 | 1·70 | 0·44 |
| ALU60×40×5·0 | 1·31 | 4·86 | 7·0 | 1·96 | 0·98 | 17·58 | 6·28 | 20·21 | 3·65 | 1·90 | 1·14 | 2·04 | 0·87 | 4·25 | 2·08 | 0·43 |
| ALU60×40×6·0 | 1·55 | 5·75 | 7·0 | 2·00 | 1·02 | 20·52 | 7·29 | 23·55 | 4·26 | 1·89 | 1·13 | 2·02 | 0·86 | 5·13 | 2·45 | 0·43 |
| ALU65×45×4·0 | 1·17 | 4·35 | 7·0 | 2·03 | 1·06 | 18·8 | 7·41 | 22·0 | 4·21 | 2·08 | 1·31 | 2·25 | 0·98 | 4·21 | 2·15 | 0·47 |
| ALU65×45×5·0 | 1·45 | 5·36 | 7·0 | 2·06 | 1·07 | 22·78 | 8·99 | 26·7 | 5·07 | 0·06 | 1·30 | 2·23 | 0·97 | 5·15 | 2·64 | 0·47 |
| ALU75×50×5·0 | 1·66 | 6·14 | 8·0 | 2·39 | 1·17 | 35·47 | 12·77 | 40·67 | 5·57 | 2·40 | 1·44 | 2·57 | 1·11 | 6·94 | 3·33 | 0·43 |
| ALU75×50×6·0 | 1·97 | 7·28 | 8·0 | 2·44 | 1·21 | 41·42 | 14·91 | 47·54 | 8·79 | 2·39 | 1·43 | 2·56 | 1·10 | 18·19 | 3·93 | 0·43 |
| ALU80×40×4·0 | 1·29 | 4·78 | 8·0 | 2·76 | 0·81 | 32·10 | 5·58 | 34·07 | 9·61 | 2·59 | 1·08 | 2·67 | 0·87 | 6·12 | 1·75 | 0·26 |
| ALU80×40×6·0 | 1·88 | 6·98 | 8·0 | 2·85 | 0·89 | 45·87 | 7·84 | 48·62 | 5·09 | 2·56 | 1·06 | 2·64 | 0·85 | 8·91 | 2·52 | 0·26 |
| ALU80×40×8·0 | 2·46 | 9·10 | 8·0 | 2·94 | 0·97 | 58·51 | 9·84 | 61·86 | 6·49 | 2·54 | 1·04 | 2·61 | 0·84 | 11·57 | 3·25 | 0·25 |
| ALU80×60×4·0 | 1·51 | 5·58 | 8·0 | 2·39 | 1·41 | 36·59 | 17·95 | 44·76 | 9·68 | 2·56 | 1·79 | 2·83 | 1·32 | 6·52 | 3·89 | 0·55 |
| ALU80×60×6·0 | 2·21 | 8·18 | 8·0 | 2·43 | 1·50 | 52·59 | 25·50 | 64·31 | 13·78 | 2·54 | 1·77 | 2·80 | 1·30 | 9·53 | 5·66 | 0·55 |
| ALU80×60×8·0 | 2·89 | 10·70 | 8·0 | 2·56 | 1·57 | 67·38 | 32·46 | 82·20 | 17·64 | 2·51 | 1·74 | 2·77 | 1·28 | 12·37 | 7·33 | 0·55 |
| ALU90×60×6·0 | 2·37 | 8·78 | 8·0 | 2·89 | 1·41 | 72·93 | 26·42 | 83·96 | 15·39 | 2·88 | 1·73 | 3·09 | 1·32 | 11·94 | 5·76 | 0·44 |
| ALU100×50×6·0 | 2·38 | 8·81 | 9·0 | 3·51 | 1·06 | 91·88 | 15·91 | 97·53 | 10·27 | 3·23 | 1·34 | 3·33 | 1·08 | 14·16 | 4·04 | 0·26 |
| ALU100×50×8·0 | 3·11 | 11·53 | 9·0 | 3·60 | 1·14 | 118·11 | 20·16 | 125·16 | 13·11 | 3·20 | 1·32 | 3·29 | 1·07 | 18·45 | 5·22 | 0·26 |
| ALU100×50×10·0 | 3·83 | 14·17 | 9·0 | 3·68 | 1·21 | 142·61 | 24·03 | 150·80 | 15·83 | 3·17 | 1·30 | 3·26 | 1·06 | 22·58 | 6·35 | 0·25 |
| ALU100×80×6·0 | 2·87 | 10·61 | 9·0 | 2·97 | 1·98 | 107·33 | 61·52 | 137·22 | 31·63 | 3·18 | 2·41 | 3·60 | 1·73 | 15·26 | 10·22 | 0·63 |
| ALU100×80×8·0 | 3·76 | 13·93 | 9·0 | 3·05 | 2·06 | 138·58 | 79·09 | 176·97 | 40·70 | 3·15 | 2·38 | 3·56 | 1·71 | 19·94 | 13·32 | 0·63 |
| ALU100×80×10·0 | 4·64 | 17·17 | 9·0 | 3·13 | 2·14 | 167·96 | 96·46 | 214·01 | 49·41 | 3·13 | 2·36 | 3·53 | 1·70 | 24·44 | 16·28 | 0·62 |
| ALU120×80×8·0 | 4·21 | 15·57 | 10·0 | 3·86 | 1·89 | 230·16 | 83·17 | 265·44 | 47·89 | 3·84 | 2·31 | 4·13 | 1·75 | 28·28 | 13·61 | 0·44 |
| ALU120×80×10·0 | 5·19 | 19·21 | 10·0 | 3·94 | 1·97 | 279·93 | 100·45 | 322·29 | 58·09 | 3·82 | 2·29 | 4·10 | 1·74 | 34·74 | 16·64 | 0·44 |
| ALU120×80×12·0 | 6·15 | 22·77 | 10·0 | 4·02 | 2·04 | 327·13 | 116·60 | 375·79 | 67·94 | 3·79 | 2·26 | 4·06 | 1·73 | 41·00 | 19·57 | 0·43 |
| ALU125×80×8·0 | 4·31 | 15·97 | 10·0 | 4·07 | 1·85 | 257·62 | 84·05 | 292·35 | 49·32 | 4·02 | 2·29 | 4·28 | 1·76 | 30·56 | 13·67 | 0·41 |
| ALU125×80×10·0 | 5·32 | 19·71 | 10·0 | 4·15 | 1·93 | 313·57 | 101·54 | 355·28 | 59·83 | 3·99 | 2·27 | 4·25 | 1·74 | 37·57 | 16·72 | 0·41 |
| ALU125×80×12·0 | 6·31 | 23·37 | 10·0 | 4·23 | 2·00 | 365·72 | 117·88 | 414·63 | 69·98 | 3·96 | 2·25 | 4·22 | 1·73 | 44·36 | 19·66 | 0·40 |
| ALU150×80×8·0 | 4·88 | 18·07 | 12·0 | 5·13 | 1·69 | 426·69 | 87·93 | 459·21 | 55·41 | 4·86 | 2·21 | 5·04 | 1·75 | 43·22 | 13·93 | 0·30 |
| ALU150×80×10·0 | 6·02 | 22·31 | 12·0 | 5·22 | 1·77 | 520·60 | 106·29 | 559·73 | 67·16 | 4·83 | 2·18 | 5·09 | 1·74 | 53·22 | 17·05 | 0·29 |
| ALU150×80×12·0 | 7·15 | 26·47 | 12·0 | 5·30 | 1·84 | 610·41 | 123·50 | 655·43 | 78·48 | 4·80 | 2·16 | 4·98 | 1·72 | 62·94 | 20·06 | 0·29 |
| ALU200×100×10·0 | 7·98 | 29·55 | 16·0 | 6·95 | 2·04 | 1245·12 | 217·90 | 1322·87 | 140·15 | 6·49 | 2·72 | 6·69 | 2·18 | 95·38 | 27·37 | 0·27 |
| ALU200×100×12·0 | 9·48 | 35·11 | 16·0 | 7·04 | 2·12 | 1466·07 | 254·59 | 1556·66 | 163·99 | 6·46 | 2·69 | 6·66 | 2·16 | 113·13 | 32·30 | 0·26 |
| ALU200×100×16·0 | 12·42 | 45·99 | 16·0 | 7·22 | 2·28 | 1886·05 | 322·58 | 1999·02 | 209·61 | 6·40 | 2·65 | 6·59 | 2·13 | 147·52 | 41·76 | 0·26 |
| ALU200×150×12·0 | 11·10 | 41·11 | 16·0 | 6·10 | 3·63</td | | | | | | | | | | | |

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4. DESIGNATION

4.1 Aluminium unequal leg angle sections shall be designated as ALU followed by lengths of the longer and shorter legs and thickness of the section in mm.

For example ALU 80 × 60 × 6.

5. DIMENSIONS AND SECTIONAL PROPERTIES

5.1 Dimensions and mass of Indian Standard aluminium unequal leg angles shall be as given in Table 1. For convenience of reference sectional properties are also given in Table 1.

5.1.1 Section of dimensions other than those included in Table 1 may also be manufactured subject to the agreement between the purchaser and the manufacturer.

5.1.2 Sections without root radius (square fillet) may also be manufactured subject to the agreement between the purchaser and the manufacturer.

Dimensional tolerances for the sections shall be as specified in 3965-1981*.

6. MATERIAL

6.1 Aluminium sections covered in this standard shall be manufactured from the following alloys in appropriate temper : 19000, 24345, 24534, 52000, 53000, 543000, 63400, 64423, 64430, 65032, and 74530.

6.1.1 Aluminium alloys and temper selected shall conform to the provisions of IS : 733-1983†.

7. PACKING

7.1 Unequal leg angle sections shall be securely bundled and wrapped in bitumanised hessian cloth or in wooden boxes or as mutually agreed. Weight of each bundle may be as agreed to between the purchaser and the manufacturer.

8. MARKING

8.1 Each lot/bundle of aluminium unequal leg angles shall be clearly marked with designation, alloy and temper, manufacturer's name and lot number/year of manufacture.

*Dimensions for wrought aluminium and aluminium alloys, bars, rods and section (*first revision*).

†Specification for wrought aluminium and aluminium alloy, bars, rods and sections (for general engineering purposes) (*third revision*).

8.2 Unequal leg angles may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

(Continued from page 2)

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

| QUANTITY | UNIT | SYMBOL |
|---------------------------|----------|--------|
| Length | metre | m |
| Mass | kilogram | kg |
| Time | second | s |
| Electric current | ampere | A |
| Thermodynamic temperature | kelvin | K |
| Luminous intensity | candela | cd |
| Amount of substance | mole | mol |

Supplementary Units

| QUANTITY | UNIT | SYMBOL |
|-------------|-----------|--------|
| Plane angle | radian | rad |
| Solid angle | steradian | sr |

Derived Units

| QUANTITY | UNIT | SYMBOL | DEFINITION |
|----------------------|---------|--------|---------------------------------|
| Force | newton | N | 1 N = 1 kg.m/s ² |
| Energy | joule | J | 1 J = 1 N.m |
| Power | watt | W | 1 W = 1 J/s |
| Flux | weber | Wb | 1 Wb = 1 V.s |
| Flux density | tesla | T | 1 T = 1 Wb/m ² |
| Frequency | hertz | Hz | 1 Hz = 1 c/s (s ⁻¹) |
| Electric conductance | siemens | S | 1 S = 1 A/V |
| Electromotive force | volt | V | 1 V = 1 W/A |
| Pressure, stress | pascal | Pa | 1 Pa = 1 N/m ² |



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